Docket No.: 1640.1035

REMARKS

This Preliminary Amendment is submitted to improve the form of the specification and claims as originally-filed.

It is respectfully requested that this Preliminary Amendment be entered in the above-referenced application.

If there are any additional fees associated with filing of this Preliminary Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: January 10, 2006

By: David M. Pitcher

David M. Pitcher
Registration No. 25,908

1201 New York Ave, N.W., Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501

10/563940
JAP15 Rec'd PCT/PTO 10 JAN 2006

RESPONSE

To: Commissioner, Patent Office

1. Identification of the International Application:

   PCT/JP03/09585

2. Applicant

   Name: NATIONAL INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

   Address: 4-2-1, Nukui-Kitamachi, Koganei-shi, Tokyo 184-8795 Japan

   Nationality: JAPAN

   Domicile: JAPAN

3. Agent

   Name: OHKAWA Yuzuru, Patent Attorney (10866)

   Address: Kaimei Patent Office, Sankyo Central Plaza Building 5F, 11-8, Nishi-Nippori 5-chome, Arakawa-ku, Tokyo 116-0013 Japan

4. Date of Notification: March 30, 2004

5. Details of Response

By the amendment separately submitted, all the independent claims 1, 2, 3, 4, 6, 7, 8, and 9 have been amended so as to clarify that "a plurality of receiving circuits, each formed as a single constituent element by combining a <u>planar printed</u> small receiving antenna and a <u>micro</u> planar receiving circuit, are disposed at intervals smaller than a wavelength corresponding to an IF band."

By virtue of this configuration, each unit receiving circuit 11, including an antenna, can be made compact by use of an MMIC technique. Further, since an oscillator is not

required to be incorporated into the unit receiving circuit 11, the unit receiving circuit 11 is basically low cost. In addition, since the IF signals obtained at the outputs of the unit receiving circuits are synchronized with one another in terms of phase and frequency, composite diversity can be readily realized through mixing these IF signals. Unlike the case of an ordinary receiving array antenna system, since the unit receiving circuits (antennas) are disposed at intervals sufficiently smaller than a wavelength corresponding to the IF band, the composite diversity effect can be attained without affecting the receiving beam pattern. Moreover, by virtue of the spatial diversity effect, it becomes possible to cope with signal phasing (e.g., considerable attenuation of a received signal depending on the receiving position), which is peculiar to millimeter-wave transmission.

The details of the reason why the present invention can achieve the excellent effects by arranging antennas as described above are described from page 11, line 2 to page 12, line 24 of the specification. A signal received by a communication system for a millimeter-wave band, for example, has a wavelength on the millimeter order. The present invention is primarily intended to achieve the excellent effects by disposing the antennas at intervals smaller than the very short wavelength.

Hover, as described in the above cited portion of the specification, in a system for a 60 GHz band (wavelength: 5 mm), for example, disposing receiving antennas at intervals

narrower than 5 mm is extremely difficult from the viewpoint of mounting. The present invention solves this problem by combining the above-described technique with a technique in which a radio modulated signal and an un-modulated carrier which are coherent with each other are transmitted simultaneously, and then detected so as to obtain an IF-band signal, which is a difference frequency component, and a plurality of IF-band signals thus obtained are mixed. Through combining these techniques, it becomes possible to dispose receiving antennas at narrow intervals, and to achieve the above-described excellent effects of the present invention.

The above-described features of the present invention are not described in any of the cited references 1 to 5.

(1) Reference 1

Reference 1 does not contain a description regarding the antenna arrangement, which is a feature of the present invention. That is, Reference 1 does not contain a description regarding the configuration in which "a plurality of receiving circuits, each formed as a single constituent element by combining a planar printed small receiving antenna and a micro planar receiving circuit, are disposed at intervals smaller than a wavelength corresponding to an IF band." By virtue of this configuration, the above-described effects of the present invention can be achieved. However, Reference 1 does not contain such a description.

(2) Reference 2

Reference 2 contains a description regarding a planar array in which a plurality of array elements are disposed, and a description regarding an irregular array such as a random array. However, not only the antenna described in Reference 2 but also the antennas described in all other references are based on techniques which are completely different from the technique of the present invention in which "a plurality of receiving circuits, each formed as a single constituent element by combining a planar printed small receiving antenna and a micro planar receiving circuit, are disposed at intervals sufficiently smaller than a wavelength corresponding to an IF band."

Therefore, the feature limited in claims 2 and 7 of the present application; i.e., "three or more receiving circuits being provided and disposed at irregular intervals which differ from one another," is not described in Reference 2. By setting the intervals irregularly, signal phasing can be prevented in most cases.

(3) Reference 3

Reference 3 contains a description regarding adjustment of the direction and position of an antenna. However, as described above, the antenna described in Reference 3 is based on a technique which is different from the technique of the present invention, and is not configured to change the intervals of the individual elements (sectors) which constitute the antenna.

The feature limited in claims 3 and 8 of the present application; i.e., "two or more substrates each carrying the receiving circuit being provided at intervals which are changed manually or automatically in accordance with the power of the IF-band composite output," is not described in Reference 3. By enabling the intervals to be changed, a radio terminal can be installed and used with an antenna interval suitable for an expected communication environment.

(4) Reference 4

Reference 4 describes a structure in which an antenna which expands two-dimensionally is used for at least one of two antennas, to thereby enable reception of an incoming radio wave having a polarization plane in any of x, y, and z directions by use of the two antennas. However, as described above, the antenna described in Reference 4 is based on a technique which is different from the technique of the present invention. Therefore, the feature limited in claims 4 and 9 of the present application; i.e., "the individual receiving circuits being arranged two-dimensionally along longitudinal and transverse directions or three-dimensionally," is not described in Reference 4. By arranging the receiving circuits in this manner, multi path phasing generated in all directions can be avoided.

(5) Reference 5

Reference 5 contains a description regarding a technique in which a circularly polarized radio wave is transmitted and received by vertical and horizontal receiving

antennas. However, the inventions of claims 5 and 10 are based on the two-dimensional or three-dimensional arrangement described in claims 4 and 9, respectively, and are characterized in that "about half the antennas used in the receiver are adapted to receive horizontally polarized waves and the remaining antennas are adapted to receive vertically polarized waves." Thus, a polarized-wave diversity effect is also attained. Reference 5 does not contain such a description.

As described above, the inventions of all the claims of the present application differ from the cited references and provide remarkable effects. It is believed that the inventions of all the claims of the present application have sufficient inventive steps.

*****